

# PATENT SPECIFICATION (11)

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## (54) A PILE

(71) We, MANNESMANNRÖHREN-WERKE AG, a German body corporate of Mannesmann-Hochhaus, 4000 Dusseldorf, Federal Republic of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The invention relates to a pile which has prop members which can be introduced into the pile after the pile-driving operation and which can be driven through lateral outlet openings in the pile into the ground.

15 Piles having prop members which consist of thin steel tubes are known, which tubes are guided and bent by deflection guides. This arrangement is complicated and difficult as regards manufacture and storage, and is unsuitable for the transmission of heavy vertical loads into the ground because of the low moment of inertia of the prop tubes.

25 A prop or spreading anchor is also known, which is equipped with a plurality of prop members which can be swung out to an abutment on the anchor member. It is a disadvantage with this constructional form that the said anchor can only be introduced into an already existing drilled or bored hole, in order to prevent a premature spreading of the elements.

30 It is the aim of the invention to provide a pile which is safeguarded against tensile and compressive forces.

35 The invention provides a pile comprising a propping unit insertable into the pile after the latter has been rammed home, the unit including a ramming plate carrying at least 40 two prop members, each prop member being at one end pivotably connected to the plate, the pile having lateral outlet openings for the prop members and including a ramming head positioned below the openings 45 and provided inside the pile with sliding surfaces for the prop members so that, on applying pressure to the ramming plate, the prop members are forced through the outlet openings and are driven into the ground.

In a preferred embodiment the pile may include further outlet openings for the prop members of a further propping unit, the outlet openings being arranged above the first mentioned outlet openings, sliding means provided with slide surfaces and bearing surfaces for the prop members being arranged in the pile below the further outlet openings, whereby further prop members can be driven into the ground.

50 The pile which is proposed in accordance with the invention has a number of advantages by comparison with prior known solutions. The spreading or prop members are fixed in a manner known *per se* so as to be movable in rotation on the ramming plate and form a self-contained insert element in association with the locking ring. After the spreading or prop members have been driven into the ground, the bent-over ends lie substantially parallel to the surface of the earth. 55 The locking ring, which is also driven by the ramming plate, prevents any penetration of the soil into the pile. By the provision of a recessed eye or lug, the ramming plate can once again be extracted from the pile and as a result carries the prop members with it. 60

In another constructional form, after driving in the lower spreading or prop members, a sliding plate and another set of prop members is placed in position with associated ramming plates. With this constructional form, the pile most obviously have outlet openings in the required planes. 65

80 An essential advantage of the pile according to the invention consists in that it is safeguarded in the vertical direction against tensile and compressive forces, i.e. with tensile forces, the prop members rest on the conical slide surfaces of the ramming head or sliding plate, respectively, and with compressive forces, the holding projections of the prop members bear on the horizontally arranged bearing surfaces of the ramming head or sliding plate, respectively, so that the pile can again be removed. 85 90 95

The invention will now be described, by way of example, with reference to the accom-

panying diagrammatic drawings, wherein:

Figure 1 shows the pile before driving in the prop members, and

5 Figure 2 shows the prop members driven into position and another set of prop members before being driven into position and in an upper plane.

10 In Figure 1, the pile 1 is provided in known manner with a ramming head 2 which is welded thereon and which is made conical on both sides and accommodates internally thereof a ramming plate 3 carrying spreading or prop members 4 pivotally fixed thereon. The ramming plate 3 is provided on its 15 upper part with an eye 13 formed by a recess and a pin. The prop members 4 are equipped at the pivot end with stop projections 8. The projections 8 limit the forcing apart of the prop members 4 by bearing 20 against an abutment surface 12 on the ramming head 2 or on a sliding plate 10. At least two prop members 4 are used. Pushed over the prop members 4 is a locking ring 7, which is formed with recesses 7<sup>1</sup> for the 25 prop members 4. The prop members 4 are so bent at 5 on the lower thirds of the members 4, that they lie approximately parallel to the earth's surface after they have been driven into position. The pile 1 is provided 30 in known manner with openings 6 through which the members 4 can emerge.

35 As shown in Figure 2, the pile 1 can be provided with several outlet openings 6<sup>1</sup>, so as to be able to drive additional prop members 4 in different planes into load-bearing ground. For this purpose, a conical sliding plate 10 provided with slide surfaces 11 is introduced below the openings 6<sup>1</sup> and fixed 40 in suitable manner, e.g. by projections. The sliding plate 10 is shown in chain-dotted lines in the drawing.

#### WHAT WE CLAIM IS:—

45 1. A pile comprising a propping unit insertable into the pile after the latter has been rammed home, the unit including a ramming plate carrying at least two prop members, each prop member being at one

50 end pivotally connected to the plate, the pile having lateral outlet openings for the prop members and including a ramming head positioned below the openings and provided 55 inside the pile with sliding surfaces for the prop members so that, on applying pressure to the ramming plate, the prop members are forced through the outlet openings and are driven into the ground.

2. A pile according to Claim 1 wherein each of the prop members has on its pivoting 60 end a projection co-operating with a corresponding abutment surface on the ramming head.

3. A pile according to Claim 1 or 2 wherein the prop members are near their free 65 ends bent or curved.

4. A pile according to any one of Claims 1 to 3 wherein a locking ring formed with outlet openings for the prop members is pushed over the prop members.

5. A pile according to any one of Claims 1 to 3 wherein the ramming plate has an 70 eye for its insertion into and removal from the prop.

6. A pile according to Claim 5 wherein part of the eye is formed by a recess in the 75 ramming plate.

7. A pile according to any one of the preceding claims including further outlet 80 openings for the prop members of a further propping unit, the outlet openings being arranged above the first mentioned outlet openings, sliding means provided with slide surfaces and bearing surfaces for the prop 85 members being arranged in the pile below the further outlet openings, whereby further prop members can be driven into the ground.

8. A pile substantially as herein described with reference to and as shown in the accompanying drawings.

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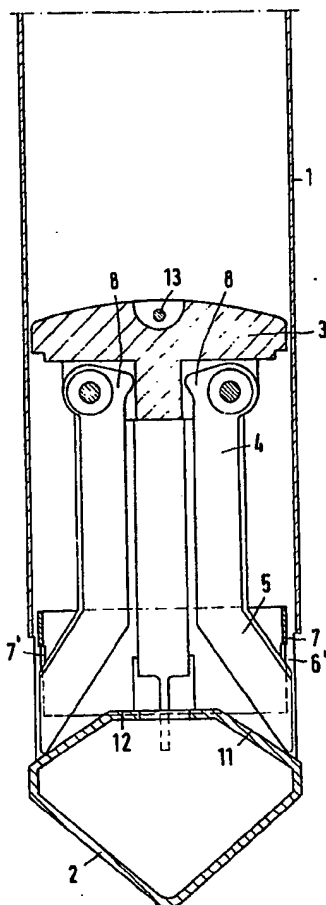
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2 SHEETS

*This drawing is a reproduction of  
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Sheet 1

Fig.1



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COMPLETE SPECIFICATION

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Sheet 2

